

Monofilament Vaporization Propulsion (MVP) System, Phase II

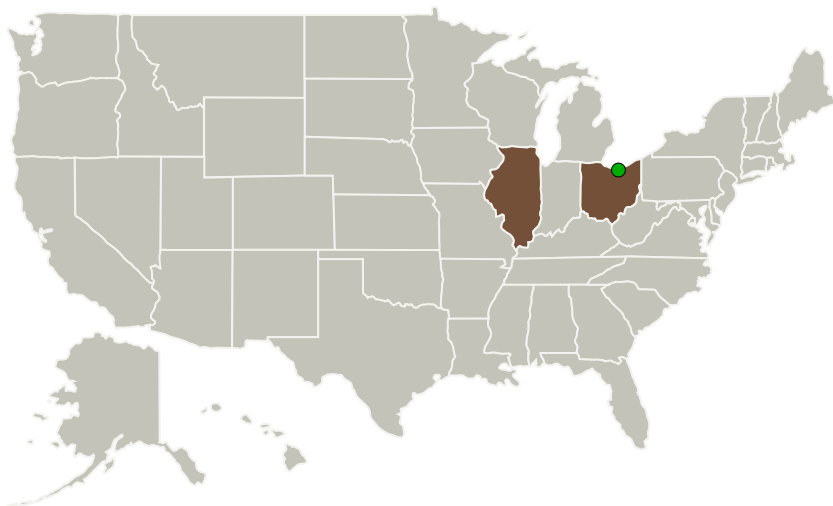
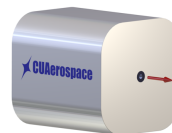
Completed Technology Project (2017 - 2020)



Project Introduction

Monofilament Vaporization Propulsion (MVP) is an innovative new propulsion technology targeted at secondary payload applications. The approach with MVP, rather than using exotic propellants to achieve maximum specific impulse and system performance, is to use an inexpensive, inert, solid propellant. This enables the use of a propulsion system on lower budget missions by lowering the unit cost (no valves or pressure vessels), and minimizes range safety expenses. By using a commercially available, space rated polymer as propellant, MVP overcomes potential issues associated with liquid propellants such as freezing, over-pressurization, degradation (of tank wall and/or propellant itself), and cg perturbations due to sloshing. As a result, MVP's standalone risk to the primary payload is no greater than that of a CubeSat not equipped with propulsion. MVP harnesses technology used in 3D printing applications to feed propellant into proven electrothermal propulsion technology developed by CU Aerospace. To date, MVP has demonstrated a continuous 105 seconds specific impulse with 20 W input power, with 107 seconds peak. Phase II performance is expected to exceed 130 seconds. This should provide 900 N-s total impulse with a 1U (10 cm x 10 cm x 10 cm) system, attributable to the high storage density and permissible thin walled construction. A 4 kg, 3U CubeSat equipped with MVP could achieve 250 m/s Delta-V while expending less than 25 W during operation. CU Aerospace will design, fabricate, and deliver a 1U MVP system to NASA at the end of the Phase II program.

Primary U.S. Work Locations and Key Partners

**Monofilament
Vaporization
Propulsion****1U
900 N-s Total Impulse**

Monofilament Vaporization
Propulsion (MVP) System, Phase
II Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
CU Aerospace, LLC	Lead Organization	Industry	Champaign, Illinois
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Illinois	Ohio
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Project Transitions

▶ **April 2017:** Project Start

✓ **January 2020:** Closed out

Closeout Documentation:

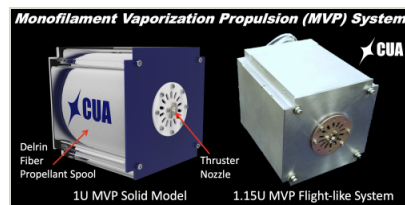
- Final Summary Chart(<https://techport.nasa.gov/file/140916>)

Images



Briefing Chart Image

Monofilament Vaporization Propulsion (MVP) System, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/133235>)



Final Summary Chart Image

Monofilament Vaporization Propulsion (MVP) System, Phase II (<https://techport.nasa.gov/image/131254>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CU Aerospace, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

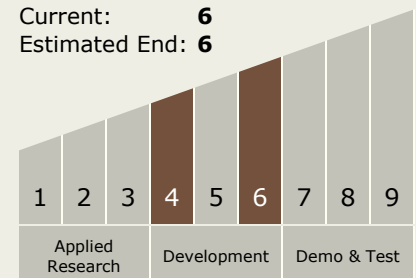
Carlos Torrez

Principal Investigator:

Curtis Woodruff

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System